

IN THE CLAIMS

Please amend the claims as noted herein. Please cancel claims 27-71 and add new claims 72 through 102. Please note that all claims currently pending and under consideration in the referenced application are shown below, in clean form, for clarity.

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C/P*
1. (Previously amended) A method for making a metallization structure for a semiconductor device, comprising:
forming a substantially planar first dielectric layer on a substrate;
forming at least one metal layer over the first dielectric layer;
forming a conducting layer over the at least one metal layer;
forming a second dielectric layer over the conducting layer;
removing aligned portions of the second dielectric layer, conducting layer, and at least one metal layer to form a multilayer structure; and
forming metal spacers on sidewalls of the multilayer structure.
 2. (Amended) The method of claim 1, wherein said forming the first dielectric layer comprises forming a silicon oxide or BPSG layer.
 3. (Amended) The method of claim 2, wherein said forming the at least one metal layer comprises forming the at least one metal layer of Ti, Ta, W, Co or Mo or an alloy or a compound of any thereof, including TaN or TiN.
 4. (Twice amended) The method of claim 3, further comprising forming a second metal layer between a first metal layer of said at least one metal layer and the substrate, said second metal layer comprising TiN, TiW, WN, or TaN.
 5. (Amended) The method of claim 1, wherein said forming the at least one metal layer comprises forming the at least one metal layer of titanium or titanium nitride.

6. (Reiterated) The method of claim 1, wherein the at least one metal layer is a single metal layer and further comprising forming the single metal layer of titanium or titanium nitride.

7. (Amended) The method of claim 1, wherein said forming the conducting layer comprises forming the conducting layer from at least one of aluminum and copper.

8. (Amended) The method of claim 7, wherein said forming the conducting layer comprises forming the conducting layer of an aluminum-copper alloy.

9. (Amended) The method of claim 1, wherein said forming the metal spacers comprises forming at least one layer of Ti, Ta, W, Co or Mo, or alloys thereof or compounds thereof, including TaN and TiN.

10. (Amended) The method of claim 9, wherein said forming the metal spacers comprises forming the metal spacers of titanium or titanium nitride.

11. (Previously amended) The method of claim 1, wherein said forming a second dielectric layer comprises forming the second dielectric layer on the conducting layer to have sidewalls aligned with sidewalls of the conducting layer, and forming the metal spacers to extend along the sidewalls of the second dielectric layer.

12. (Previously amended) The method of claim 11, further comprising forming the second dielectric layer of a low dielectric constant material.

13. (Previously amended) The method of claim 12, further comprising forming the second dielectric layer of a fluorine-doped silicon oxide.

14. (Reiterated) The method of claim 1, further comprising forming the at least one metal layer and the metal spacers of the same metal.

15. (Amended) The method of claim 1, wherein said forming the at least one metal layer comprises forming the at least one metal layer by vapor deposition.

16. (Twice amended) The method of claim 1, wherein said forming the at least one metal layer comprises forming the at least one metal layer by CVD, PVD or PECVD.

17. (Amended) The method of claim 1, wherein said forming the conducting layer comprises forming the conducting layer by vapor deposition.

18. (Reiterated) The method of claim 17, further comprising forming the conducting layer by CVD, PVD or PECVD.

19. (Amended) The method of claim 1, wherein said forming the metal spacers comprises forming the metal spacers by vapor deposition and directional etching.

20. (Reiterated) The method of claim 19, further comprising effecting the vapor deposition as CVD, PVD or PECVD.

21. (Previously amended) The method of claim 1, wherein removing aligned portions of the second dielectric layer, conducting layer, and at least one metal layer to form the multilayer structure is effected by patterning and etching the second dielectric layer, the conducting layer, and the at least one metal layer.

Cancelled

22. (Twice amended) The method of claim 1, wherein said forming the metal spacers comprises forming a metal spacer layer over the multilayer structure and first dielectric layer and removing portions thereof overlying the first and second dielectric layers.

23. (Twice amended) The method of claim 22, wherein said forming the metal spacers comprises forming the metal spacer layer over the multilayer structure and first dielectric layer by a conformal deposition process.

24. (Previously amended) The method of claim 23, wherein portions of the metal spacer layer over the multilayer structure and first dielectric layer are removed by etching.

25. (Reiterated) The method of claim 1, further comprising:
removing any remaining portion of the second dielectric layer and upper portions of the metal spacers laterally adjacent thereto.

26. (Previously amended) The method of claim 25, further comprising removing any remaining portion of the second dielectric layer and upper portions of the metal spacers by etching.

C1 C2 C3 X

72. (New) A method for constructing a metallization structure for a semiconductor device, comprising:
providing a substrate having a dielectric layer underlying at least one metal layer;
creating a conducting layer over the at least one metal layer;
removing aligned portions of the conducting layer and at least one metal layer to form a multilayer structure; and
flanking at least one surface of the multilayer structure with a metal spacer.

73. (New) The method of claim 72, further comprising forming a second dielectric layer over said conducting layer.

74. (New) The method of claim 73, wherein said removing further comprises removing aligned portions of said second dielectric layer to form said multilayered structure.

75. (New) The method of claim 73, wherein said flanking at least one surface of the multilayer structure with a metal spacer comprises forming a metal spacer layer on said second dielectric layer.

76. (New) The method of claim 75, further comprising removing any remaining portion of the second dielectric layer and upper portions of the metal spacer layer laterally adjacent thereto.

77. (New) The method of claim 76, wherein said removing any remaining portion is effected by etching.

78. (New) The method of claim 72, wherein said providing a substrate having a dielectric layer comprises forming said dielectric layer of a silicon oxide or BPSG layer.

79. (New) The method of claim 72, wherein said providing a substrate having a dielectric layer underlying at least one metal layer comprises forming the at least one metal layer of Ti, Ta, W, Co or Mo or an alloy or a compound of any thereof, including TaN or TiN.

80. (New) The method of claim 79, wherein said forming the at least one metal layer comprises forming the at least one metal layer of titanium or titanium nitride.

81. (New) The method of claim 72, further comprising forming a second metal layer between the first metal layer and the substrate, said second metal layer comprising TiN, TiW, WN, or TaN.

82. (New) The method of claim 72, wherein the at least one metal layer is a single metal layer and further comprising forming the single metal layer of titanium or titanium nitride.

83. (New) The method of claim 72, wherein said creating a conducting layer comprises forming the conducting layer from at least one of aluminum and copper.

84. (New) The method of claim 72, wherein said creating a conducting layer comprises creating the conducting layer of an aluminum-copper alloy.

85. (New) The method of claim 72, wherein said flanking comprises forming the metal spacer of at least one layer of Ti, Ta, W, Co or Mo, or alloys thereof or compounds thereof, including TaN and TiN.

86. (New) The method of claim 85, wherein said forming the metal spacer comprises forming the metal spacers of titanium or titanium nitride.

87. (New) The method of claim 72, wherein said flanking at least one edge comprises forming said metal spacer on sidewalls of said multilayer structure.

88. (New) The method of claim 72, wherein said flanking at least one surface comprises forming said metal spacer on a top surface of said multilayer structure.

89. (New) The method of claim 72, further comprising forming a second dielectric layer on the conducting layer to have sidewalls aligned with the conductive layer sidewalls, and forming the metal spacer to extend along the sidewalls of the second dielectric layer.

90. (New) The method of claim 89, wherein said forming the second dielectric layer comprises forming the second dielectric layer of a low dielectric constant material.

91. (New) The method of claim 90, wherein said forming the second dielectric layer comprises forming the second dielectric layer of a fluorine-doped silicon oxide.

92. (New) The method of claim 72, further comprising forming the at least one metal layer and the metal spacer of the same metal.

93. (New) The method of claim 72, wherein said providing a substrate having a dielectric layer underlying at least one metal layer comprises forming the at least one metal layer by vapor deposition.

94. (New) The method of claim 93, wherein said forming the at least one metal layer by vapor deposition comprises forming the at least one metal layer by CVD, PVD or PECVD.

95. (New) The method of claim 72, wherein said creating a conducting layer comprises forming the conducting layer by vapor deposition.

96. (New) The method of claim 95, wherein said forming the conducting layer by vapor deposition comprises forming the conducting layer by CVD, PVD or PECVD.

97. (New) The method of claim 72, wherein said flanking comprises forming the metal spacer by vapor deposition and directional etching.

98. (New) The method of claim 97, further comprising effecting the vapor deposition as CVD, PVD or PECVD.

99. (New) The method of claim 72, wherein removing aligned portions of the conducting layer and at least one metal layer to form a multilayer structure is effected by patterning and etching the conducting layer and the at least one metal layer.

100. (New) The method of claim 72, wherein said flanking comprises forming the metal spacer by forming a metal spacer layer over the multilayer structure and first dielectric layer and removing portions thereof overlying the first dielectric layer and a top portion of said multilayer structure.

101. (New) The method of claim 100, wherein said forming the metal spacer layer over the multilayer structure and first dielectric layer comprises forming the metal layer by a conformal deposition process.

102. (New) The method of claim 101, wherein said removing portions of the metal spacer layer is effected by etching.

